ATTACHMENT 4
WASTE ANALYSIS PLAN

The chemical and physical characteristics of the chemical agent identification set (CAIS) components (containing chemical agent) that will be accepted for treatment in the Rapid Response System are discussed in this Attachment. This section provides a general description of the process; Attachment 2 provides details on the process description of the Rapid Response System.

The Rapid Response System glovebox will consist of three coupled stations: an airlock station, unpack station, and neutralization station. Treatment of the chemical agents will take place in the nominal 1-gallon reactor in the neutralization station of the glovebox. Treatment (chemical oxidation) of chemical agent-contaminated solid dunnage (including packing materials) will take place in the glovebox or in the solids drum. This section does not address the repackaging of industrial chemical CAIS components.

Section 4-1 describes the chemical and physical analyses of CAIS components that will be accepted for treatment in the neutralization station, unpack station catch tray, and the solids drum of the Rapid Response System glovebox. Section 4-2 addresses waste analysis requirements pertaining to Land Disposal Restrictions (LDRs).

4-1 CHEMICAL AND PHYSICAL ANALYSES [40 CFR 264.13(a) and 270.14(b)(2); R315-3-5, 3-7, and R315-8-2.4]

CAIS components containing sulfur mustards (H/HD), nitrogen mustards (HN-1, HN-3), and lewisite (L) will be treated in the neutralization station of the Rapid Response System glovebox. Section 4-1a describes the physical and chemical analyses of the chemical agents and chemical agent-contaminated solid dunnage to be treated, their hazardous characteristics, and the basis for the hazard designation, including the pertinent Resource Conservation and Recovery Act (RCRA) and State of Utah hazardous waste codes. This information is provided based on process knowledge, material safety data sheets (MSDSs), and/or chemical and physical analyses. Appendix 4-1 provides a detailed description of the CAIS and CAIS components. Appendix 4-2 describes process test chemistry.

4-1a Wastes in Miscellaneous Units [40 CFR 270.23(d); R315-3-6(a)(8)]

CAIS components containing the following chemical agents: sulfur mustards, nitrogen mustards, and Lewisite, will be treated in the neutralization station of the Rapid Response System glovebox. These CAIS components will be chemically treated in the 1-gallon reactor located in the neutralization station of the glovebox. Treatment operations will be conducted by glovebox operators from outside of the glovebox through glove ports. Chemical oxidation in the context of this permit application is defined as the addition of treatment (oxidizing) reagents to the chemical agents to alter the chemical characteristics of the chemical agents, thereby producing a less toxic product. Section 4-1a (3) addresses the treatment effectiveness of these wastes.

The waste streams to be treated are of the following types:

- Sulfur mustard (H/HD) in plastic-capped or fusion-sealed bottles (K941 and K942 CAIS);

- o Nitrogen mustard (HN-1 only), sulfur mustard (H/HD), or Lewisite in chloroform ($CHCl_3$) solution sealed in glass ampules (K951 through K954 CAIS);
- o Nitrogen mustard (HN-1, HN-3), sulfur mustard (H/HD), or Lewisite adsorbed onto activated charcoal in glass-stoppered bottles (Navy K955, X302, X547, X548, X550, and X551 CAIS);
- o Chemical agent-contaminated dunnage (which includes packing materials); and
- o Chemical agent/industrial chemical-contaminated dunnage
  (Note: This waste stream will only be treated for chemical agent; ancillary treatment of the industrial chemical may result in the process of treating the chemical agent).

Table 4-1 designates the hazardous wastes (chemical agents and contaminated dunnage) that will be treated in the Rapid Response System glovebox, the associated hazardous waste codes, and the basis for hazard designation.

4-1a (1) Chemical Agent CAIS Requiring Treatment

The chemical agents (sulfur mustard, nitrogen mustard, and Lewisite) accepted for treatment by the Rapid Response System may contain the following toxicity characteristic metals as impurities: arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011). Chemical agent lewisite contains arsenic in its chemical structure, and thus the waste code D004 may apply. The toxicity characteristic organics chloroform (D022), 1,2-dichloroethane (D028), hexachloroethane (D034), tetrachloroethylene (D039), trichloroethylene (D040), and vinyl chloride (D043) have been identified as impurities or degradation products of mustard agents. The waste code D022 may apply to the chemical agent/chloroform solution CAIS due to the presence of the chloroform. All of these toxicity characteristic metal and organic waste codes may not apply to each chemical agent type but have been assigned as a conservative approach because of the potential that they may be present in the waste stream above regulatory levels. Assignment of waste codes to the resultant treatment residues will be based on actual waste characterization analysis performed by a Utah-certified laboratory.

CAIS will be unpacked in the unpack station of the Rapid Response System glovebox. After being unpacked from the PIGs, the CAIS components accepted by the Rapid Response System glovebox will be visually examined to confirm their contents. An attempt will be made to identify all carbon-containing CAIS items by etching and labels on bottles. All bottles or ampules containing liquid material will be subjected to Raman spectrometry to aid in identification. The Raman spectrophotometer will nonintrusively detect the presence of industrial chemicals (chloroform, chloropicrin) which, when combined with generator knowledge, will enable the operator to characterize the contents. More information on the operation of the Raman spectrophotometer and the CAIS identification procedures is provided in Attachment 2.

If a CAIS leaker is found, the contaminated packing material and miscellaneous solid dunnage (for example, metal pig parts, absorbent, cardboard, etc.) will be decontaminated with either 5-percent sodium hypochlorite or 1,3-dichloro-5,5-dimethylhydantion (DCDMH)/chloroform/t-butyl alcohol/water mixture. Section 4-1a(2) addresses this non-routine operation.

Table 4-2 illustrates the chemical agents to be treated and their respective treatment reagents. The chemical agent/chloroform solutions (H/HD, HN-1, and L), sulfur mustard (H/HD), and the charcoal impregnated with Lewisite will be treated with an oxidizing agent (DCDMH) in a 48.5:48.5:3 volume percent mixture of chloroform, t-butyl alcohol, and water (H_2O). The charcoal impregnated with nitrogen and sulfur mustard will be treated with DCDMH and chloroform to chemically oxidize the chemical agent on charcoal.

The four treatment processes will occur independently of one another. Procedural controls will ensure use of the correct treatment reagent. Predetermined quantities of the treatment reagents will be used. The resulting mixture of chemical agent and treatment reagent/solvent mixture will be agitated for a predetermined time to ensure complete chemical oxidation. The test chemistry for these treatment processes is provided in Appendix 4-2.

The Rapid Response System glovebox system and the neutralization station reactor vessel have been designed specifically to handle the chemical agents being accepted for treatment; therefore, all waste materials will be compatible with the treatment unit. Attachment 2 discusses the details on the materials of construction and their compatibility.

The treatment residues generated from the treatment operations will be known as the neutralent waste streams categorized as RED, BLUE, CHARCOAL (mustard), and CHARCOAL "L" (lewisite). The CHARCOAL and CHARCOAL "L" treatment residues will not be combined into a single waste container. The RED process neutralent will be generated separately from the BLUE and the CHARCOAL process neutralents. The neutralent waste streams will be liquid and may contain pieces of glass (from CAIS bottles and the Pyrex^{Ô} ampules) and charcoal (CHARCOAL process neutralents only). The RED, BLUE, and CHARCOAL waste streams will be kept segregated in their own respective approved drums [meeting Department of Transportation (DOT) specifications]. Attachment 2 provides details on the treatment processes.

Table 4-3 designates the resultant treatment residues generated from the treatment operations for those wastes identified in Table 4-1; the waste composition, associated waste codes, and the basis for hazard designation. The CHARCOAL process neutralent may be assigned the toxicity characteristic organic waste codes D019, D022, D028, D034, D039, D040, and D043 due to the presence of carbon tetrachloride; chloroform; 1,2-dichloroethane or 1,1-dichloroethane; hexachloroethane; tetrachloroethylene; trichloroethylene; and vinyl chloride, respectively, as treatment reaction products. This information is based on bench-scale reactions conducted at the U.S. Army Edgewood Research, Development and Engineering Center (ERDEC) located in Edgewood, Maryland. All treatment residues generated from the chemical oxidation of chemical agents that have been treated below the treatment goal of 50 ppm of chemical agent will be considered acutely toxic and will be assigned the State of Utah hazardous waste code F999. Filters that have been exposed to chemical agent and any treatment residues containing greater than 50 ppm chemical agent will carry the waste code P999. Table 4-4 presents potential decomposition products of the chemical agents due to age, which is based on munition stockpile data. The neutralent waste streams may be a RCRA corrosive waste, thus assigned the waste code D002. This waste code will be assigned based on actual waste characterization results from a Utah-certified laboratory. The neutralents are not expected to be an oxidizer per 49 CFR 173.127. Generator and process knowledge will be used to characterize the treatment residues. Sampling and analysis from a Utah-certified laboratory will be used to confirm the presence or absence of these RCRA characteristics prior to shipment offsite to a TSDF.

4-1a(2) Chemical Agent-Contaminated Dunnage Requiring Treatment

If a CAIS PIG is opened in the unpack station of the Rapid Response System glovebox and a leaking CAIS component is found, monitoring will be conducted with colorimetric tubes and MINICAMS® to determine what has leaked. Only chemical agent CAIS leakers will be treated since industrial chemicals do not require further treatment prior to repackaging and shipping offsite to a TSDF. If the leaker is determined to be chemical agent, then the intact CAIS components will be wiped with either 5-percent sodium hypochlorite or DCDMH/chloroform/t-butyl alcohol/water and placed into their appropriate holding racks. The leaking CAIS component(s) and the associated chemical agent-contaminated dunnage (including packing materials) will be treated with a decontamination solution (5-percent sodium hypochlorite and/or the treatment reagent mixture). If the leak is determined to be both chemical agent and an industrial chemical, the dunnage will be treated (with the decontamination solution) for the chemical agent contamination only. Ancillary treatment of the industrial chemicals may occur in the process.

Treated dunnage (treatment residues) will be placed into approved drums (meeting DOT specifications) under the unpack station. A representative sample will be taken in accordance with SW-846 guidance for chemical agent analysis. If chemical agent analysis indicates chemical agent levels above the Army-established treatment goals presented in Table 4-5, additional decontamination solution will be added to the solids drum while under engineering controls, sampling and analysis will be repeated until chemical agent concentration is below 50 ppm. Table 4-5 presents the treatment goals for both the neutralents and the decontaminated dunnage waste streams. The treatment goals outlined in Table 4-5 are based on the analytical levels of quantification (LOQs) for a given waste stream matrix. Actual chemical agent levels in the treatment residue waste streams are expected to be lower than these LOQ levels. Any value between the MDL and 50 ppm will be reported to the Executive Secretary.

Attachment 2 provides details on the treatment processes. Table 4-3 describes the treatment residues resulting from these treatment operations.

4-1a(3) Treatment Effectiveness

During Rapid Response System treatment operations, treatment effectiveness of chemical agent oxidation will be determined by chemical agent analysis of a representative sample from each of the neutralent and decontaminated dunnage waste drums.

To determine effectiveness of the treatment, chemical agent analysis will be conducted using a representative sample from each neutralent waste drum and decontaminated dunnage drum. These samples will be taken prior to shipment offsite to a TSDF. This chemical agent analysis will be conducted at an approved agent laboratory by qualified personnel. Section 4-2 provides more details on the chemical agent sampling and analysis.

Treatment will be considered effective and successful when chemical agent analytical results confirm chemical agent oxidation to the treatment goal of less than 50 ppm and excess oxidant must be present in the neutralent. The neutralent and decontaminated dunnage waste streams (treatment residues) may be released for offsite shipment to an approved hazardous waste TSDF provided that the chemical agent treatment goal of less than 50 ppm has been met.

If analytical results show that the treatment was not effective, (that is, agent concentration is not below 50 ppm) the drum will be placed under engineering controls, and further treatment of the waste in the drum will be conducted until analytical results show chemical agent concentration below 50 ppm.

Table 4-1.
Waste Streams to Be Treated in the Rapid Response System

Description	RCRA Waste Code	Basis for Classification
Sulfur Mustard CAIS[a] (H/HD) and subsequent treatment residues	D004 - D011[b], D022, D028, D034, D039, D040, D043[c], P999[d]	The State of Utah lists these chemical agents as acutely hazardous. Several TC organics have been identified as degradation compounds of mustards. These TC analytes are: o chloroform (D022) o 1,2-dichloroethane (D028) o hexachloroethane (D034) o tetrachloroethylene (D039) o trichloroethylene (D040) o vinyl chloride (D043)
Nitrogen Mustard CAIS[a] (HN-1, HN-3) and subsequent treatment residues	D004 - D011[b], D022; P999[d]	The State of Utah lists these chemical agents as acutely hazardous. Several TC organics have been identified as degradation compounds of the mustards (D022, D028, D034, D039, D040, and D043).
Lewisite CAIS[a] and subsequent treatment residues	D004 - D011[b], D022, P999[d]	The State of Utah lists these chemical agents as acutely hazardous. Lewisite contains arsenic in its chemical structure. The waste code D022 applies to lewisite CAIS components containing chloroform.
Chemical Agent-Contaminated Solid Dunnage (N-Mustard, S-Mustard, or Lewisite)	D004 - D011[b], D022, D028, D034, D039, D040, D043[c]; P999[d]	This waste stream will be a listed waste in the State of Utah due to the presence of chemical agent. The packing materials and miscellaneous solid dunnage may contain TC metals and organics as a result of the degradation and impurities of chemical agents. The CAIS pigs also contain lead gaskets, which will result in the waste code D008.
Chemical Agent/Industrial Chemical-Contaminated Solid Dunnage	D004 - D011[b], D022, D028, D034, D039, D040, D043[c]; P033[e], P095[e]; P999[d]	This waste stream will be a listed waste in the State of Utah due to the presence of chemical agent. The packing materials and miscellaneous solid dunnage may contain TC metals and organics as a result of the degradation and impurities of chemical agents. The CAIS pigs also contain lead gaskets, which will result in the waste code D008. The waste codes P033 and/or P095 may apply if the waste stream is contaminated with cyanogen chloride and/or phosgene, respectively.

Table 4-1.
Waste Streams to Be Treated in the Rapid Response System

Description	RCRA Waste Code	Basis for Classification

Notes:

[a] There are three types of CAIS components presented in the text of Section C-1h: (1) Diluted sulfur mustard, nitrogen mustard, or lewisite in chloroform solutions; (2) sulfur mustard, nitrogen mustard, or Lewisite adsorbed on charcoal; and (3) neat sulfur mustard (H/HD). The CAIS color codes are presented in Attachment C-1 and Table D-2 of this permit application.

[b] Toxicity Characteristic (TC) metals have been assumed to be impurities in chemical agents. All waste numbers listed may not apply.
Note: Lewisite contains arsenic in its chemical structure.

[c] Chloroform (D022), 1,2-dichloroethane (D028), hexachloroethane (D034), tetrachloroethylene (D039), trichloroethylene (D040), and vinyl chloride (D043) have been identified as impurities in or degradation products of mustards.

[d] The State of Utah lists chemical agents H/HD, HN-1, HN-3, and L as acutely toxic, therefore applying the State waste code P999.

[e] The waste code(s) P033 (cyanogen chloride) and/or P095 (phosgene) may apply if a leak of chemical agent and phosgene and/or cyanogen chloride is determined. The waste stream will only be treated for the chemical agent; ancillary treatment of these industrial chemicals may occur in the process.

CAIS = chemical agent identification set
N-Mustard = nitrogen mustard
RCRA = Resource Conservation and Recovery Act
S-Mustard = sulfur mustard
TC = toxicity characteristic

Table 4-2
Chemical Agent Identification Set Materiel and Treatment Reagents

CAIS Materiel	Treatment Reagents	Neutralent Waste Streams
Nitrogen mustard (HN-1 only), sulfur mustard, and lewisite in chloroform solution	DCDMH (in 48.5:48.5:3% volume mixture of chloroform, t-butyl alcohol, and H_2O)	RED
Sulfur mustard (H/HD)	DCDMH (in 48.5:48.5:3% volume mixture of chloroform, t-butyl alcohol, and H_2O)	BLUE
Nitrogen mustard and sulfur mustard adsorbed onto charcoal	DCDMH (in chloroform)	CHARCOAL
Lewisite adsorbed onto charcoal	DCDMH (in 48.5:48.5:3% volume mixture of chloroform, t-butyl alcohol, and H_2O)	CHARCOAL "L"
Chemical agent-contaminated dunnage (vermiculite and similar packing materials)	DCDMH (in 48.5:48.5:3% volume mixture of chloroform, t-butyl alcohol, and H_2O)	Decontaminated dunnage
Chemical agent-contaminated dunnage (sawdust, cardboard, metal)	5% Sodium hypochlorite	Decontaminated dunnage

Table 4-3.
Rapid Response System Treatment Residues

Description	Approximate Composition	Potential RCRA Waste Code (s)	Basis for Classification
BLUE Process Neutralent[f] [Sulfur Mustard (DCDMH)]	Liquid-Solid phases: Chloroform: 54.5-55.4% t-butyl alcohol: 26-27% Chloro-5,5-dimethylhydantoin: 2.1-5.9% 5,5-dimethylhydantoin: 1-3% Chlorinated sulfoxides (diethyl and ethyl vinyl): 5.4-7.6% Chlorinated sulfones (diethyl and ethyl vinyl): 0-0.1% 1,1,2-Trichloroethane: 0-0.015% Tetrachloroethane[g]: 0-0.025% Chlorobutanes: 2.4-3.4% Water: 2.2-2.4% Glass, plastic, etc.: 2-3%	D002 D004-D011[a], D022, D028, D034, D039, D040, D043[b]; P999, F999[e]	This neutralent waste stream may be a RCRA corrosive waste, thus the waste code D002 applies. This waste stream may contain TC metals and organics as a result of degradation products from the mustard agents. The State of Utah lists the treatment residues from the destruction of chemical agents as acutely hazardous.
RED Process Neutralent[f] [Nitrogen Mustard (HN-1 only), Sulfur Mustard, Lewisite/Chloroform[d] (DCDMH)]	Liquid-Solid phases: Chloroform: 60-61% t-Butyl alcohol: 17-20% Chlorobutanes: 1.2-4.6% Water: 1.7-1.9% 1,3-Dichloro-5,5-dimethylhydantoin: 0-4.6% Chloro-5,5-dimethylhydantoin: 1.9-5.6% 5,5-dimethylhydantoin: 0-4.6% Chlorinated sulfoxides (diethyl and ethyl vinyl): 0.6-2.1% Chlorinated sulfones (diethyl and ethyl vinyl): 0-0.06% bis-(2-chloroethyl)amine: 0-1% Chlorovinylarsonic acid: 0-2.6% 1,1,2-Trichloroethane: 0-0.23% Tetrachloroethane[g]: 0-0.2% Acetaldehyde and chloroacetaldehyde: 0-0.5% glass and plastic: 7.5-10%	D002 D004-D011[a], D022, D028, D034, D039, D040, D043[b]; P999, F999[e]	This neutralent waste stream may be a RCRA corrosive waste, thus the waste code D002 applies. This waste stream may contain TC metals and organics as a result of degradation products from the chemical agents. The waste code D022 is applied due to the presence of chloroform in the neutralent waste stream. The State of Utah lists the treatment residues from the destruction of chemical agents as acutely hazardous.

Table 4-3.
Rapid Response System Treatment Residues

Description	Approximate Composition	Potential RCRA Waste Code (s)	Basis for Classification
CHARCOAL/CHARCOAL "L" Process Neutralent[f,g,h] [Nitrogen Mustard, Sulfur Mustard, Lewisite/charcoal (DCDMH)]	Liquid-Solid phases: Chloroform: 50-84% t-Butyl alcohol: 0-24% 1,3-Dichloro-5,5-dimethylhydantoin: 0-7% Chloro-5,5-dimethylhydantoin: 2-6% 5,5-dimethylhydantoin: 0-3% Polychlorinated diethyl sulfides and polychlorinated ethyl vinyl sulfide[i]: 0-2% Chlorinated sulfoxides (diethyl and ethyl vinyl)[j]: 0-0.4% Chlorinated sulfones (diethyl and ethyl vinyl)[j]: 0-0.3% 1,1,2-Trichloroethane: 0-0.025% Tetrachloroethane[g]: 0-0.022% Dichloroethane[k]: 0-0.03% Pentachloroethane: 0-0.03% Hexachloroethane: 0-0.01% Trichloroethylene: 0-0.05% Chloral hydrate (or chloral): 0-0.7% bis-(2-chloroethyl)amine: 0-0.5% N-Chloropolychloroethylamines: 0-0.6% Chlorovinylarsonic acid: 0-3% Chlorobutanes and chlorobutenes[l]: 0-4% Water: 0-1% Charcoal: 5-5.2% Glass: 5-8%	D002 D004-D011[a], D019, D022, D028, D034, D039, D040, D043[b];P999, F999[e]	This neutralent waste stream be classified as a RCRA corrosive waste, thus the waste code D002 applies. This waste stream may contain TC metals and organics as a result of degradation products from the mustard agents. Lewisite contains arsenic in its chemical structure. Hexachloroethane (D034); 1,2-dichloroethane (D028); and trichloroethylene (D040) may result as reaction products of sulfur mustard. Carbon tetrachloride (D019) may result as a reaction product of the treatment of nitrogen mustard. Chloroform (D022) is used as a component of the treatment reagent. The State of Utah lists the treatment residues from the destruction of chemical agents as acutely hazardous.
Decontaminated (Agent) Dunnage (5% sodium hypochlorite and/or DCDMH/ chloroform/t-butyl alcohol/water)	Absorbent material Metal PIG parts Cardboard Glass Rags Agent products 5% sodium hypochlorite DCDMH/chloroform/t-butyl alcohol/water	D004-D011[a], D022, D028, D034, D039, D040, D043[b]; P999, F999[e]	The decontaminated dunnage/packing material waste stream may contain TC metals and organics as a result of degradation products from the chemical agents. The CAIS metal pigs may have lead gaskets that will result in the waste code D008. The State of Utah lists the treatment residues from the destruction of chemical agents as acutely hazardous.

Table 4-3.
Rapid Response System Treatment Residues

Description	Approximate Composition	Potential RCRA Waste Code (s)	Basis for Classification
Decontaminated (Agent/Industrial Chemical) Dunnage (5% Sodium Hypochlorite and/or DCDMH/ chloroform/t-butyl alcohol/water)	Absorbent material Metal PIG Parts Cardboard Glass Rags Agent/industrial chemical products 5% sodium hypochlorite DCDMH/chloroform/t-butyl alcohol/water	D004-D011[a], D022, D028, D034, D039, D040, D043[b]; P033, P095[c]; P999, F999[e]	The decontaminated dunnage/packing material waste stream may contain TC metals and organics as a result of degradation products from the chemical agents. The CAIS metal pigs may have lead gaskets that will result in the waste code D008. The State of Utah lists the treatment residues from the destruction of chemical agents as acutely hazardous.

Notes:

[a] Toxicity characteristic (TC) metals have been assumed to be impurities in chemical agents. All waste numbers listed may not apply.

Note: Lewisite contains arsenic in its chemical structure. Actual waste characterization analysis may be required prior to ultimate disposal to determine all applicable waste codes for the treatment residues.

[b] Chloroform (D022), 1,2-dichloroethane (D028), and vinyl chloride (D043) have been identified as impurities in or degradation products of mustards. Carbon tetrachloride (D019), hexachloroethane (D034), and trichloroethylene (D040) have been found to be reaction products of the sulfur mustard CHARCOAL process. Carbon tetrachloride (D019) has been found as a reaction product of the HN-1 CHARCOAL treatment reaction.

[c] The waste code(s) P033 (cyanogen chloride) and/or P095 (phosgene) may apply if a leak of chemical agent and phosgene and/or cyanogen chloride is determined. The waste stream will only be treated for the chemical agent; ancillary treatment of these industrial chemicals may occur in the process.

[d] Chemical agents are the sole active ingredients in these mixtures. Chloroform is a carrier, and, as such, the mixture is regulated in accordance with 40 CFR 261.33(d).

[e] The State of Utah lists the residue from the treatment of chemical agents H/HD, HN-1, HN-3, and L as acutely toxic, therefore applying the state waste codes P999 or F999. Treatment residues that contain less than 50 ppm chemical agent will be assigned the waste code F999. Treatment residues that contain greater than 50 ppm chemical agent and contaminated charcoal will be assigned the waste code P999.

[f] Waste code determination on the neutralent waste streams will be completed using analytical data obtained from bench-scale demonstrations conducted at Edgewood Research, Development and Engineering Center (ERDEC). The bench-scale analysis will establish a baseline composition for the neutralent waste streams.

[g] May be either isomer, 1,1,1,2-tetrachloroethane or 1,1,2,2-tetrachloroethane.

[h] Some components of these residues will be present only if the Lewisite is treated (uses the mixed solvent) or if water is introduced into the reaction.

[i] Contains substances with more than two chlorines per molecule, that is, no H mustard is present.

[j] These components are formed only if the Lewisite residue is mixed with the HD treatment residues.

[k] Component may be either isomer, namely: 1,1-dichloroethane or 1,2-dichloroethane.

[l] These components will be present only if lewisite treatment residues are mixed with the other residues from the other charcoal processes.

CAIS = chemical agent identification set
N-Mustard = nitrogen mustard
RCRA = Resource Conservation and Recovery Act
S-Mustard = sulfur mustard
TC = toxicity characteristic

Table 4-4.
Potential Decomposition Products of the Chemical Agents to Be Treated

Chemical Agent Type	Decomposition Products from Age

Sulfur Mustards (H/HD)	2-methyl-1-propene;
	thiirane;
	2-chlorobutane;
	1, 2-dichloroethane;
	1, 4-oxathiane;
	1, 4-dithiane;
	trichloroethylene;
	1, 2, 5-trithiepane;
	tetrachloroethylene;
	1, 1, 2, 2-tetrachloroethane;
	2-chloroethyl 3-chloropropyl sulfide;
	bis(2-chloropropyl) sulfide;
	2-chloroethyl 4-chlorobutyl sulfide;
	bis(2-chloroethyl) disulfide;
	2-chloroethyl 2-(chloroethoxy)ethyl sulfide;
	1, 2-bis(2-chloroethylthio)ethane;
	bis(2-chloroethyl) trisulfide;
	hexachloroethane;
	vinyl chloride;
	chloroform

Nitrogen Mustards (HN-1, HN-3)	Polymeric quaternary ammonium salts
Lewisite (L)	Chlorovinyl arsenous oxide; HCl

Note: The information presented in this table is based on historical munitions stockpile data.

Table 4-5. U.S.
Army-Established Chemical Agent Treatment Goals for CAIS Materiel

CAIS Materiel	Treatment Goals[a]
Sulfur mustard [in DCDMH][b] (chloroform)	<50 mg/L
Nitrogen mustard (HN-1) [in DCDMH][b] (chloroform)	<50 mg/L
Lewisite [in DCDMH][b] (chloroform)	<50 mg/L
Sulfur mustard [in DCDMH][b]	<50 mg/L
Sulfur mustard [in DCDMH][b] (charcoal)	<50 mg/kg
Nitrogen mustard [in DCDMH][b] (charcoal)	<50 mg/kg
Lewisite [in DCDMH][b] (charcoal)	<50 mg/kg
Chemical agent-contaminated dunnage (H/HD) [5% sodium hypochlorite and/or DCDMH/chloroform][b]	<50mg/kg
Chemical agent/industrial chemical-contaminated dunnage (H/HD) [5% sodium hypochlorite and/or DCDMH/chloroform/t-butyl alcohol/water][b]	<50mg/kg
Chemical agent-contaminated dunnage (HN) [5% sodium hypochlorite and/or DCDMH/chloroform/t-butyl alcohol/water][b]	<50 mg/kg
Chemical agent/industrial chemical-contaminated dunnage (HN) [5% sodium hypochlorite and/or DCDMH/chloroform/t-butyl alcohol/water][b]	<50 mg/kg
Chemical agent-contaminated dunnage (L) [5% sodium hypochlorite and/or DCDMH/chloroform/t-butyl alcohol/water][b]	<50 mg/kg
Chemical agent/industrial chemical-contaminated dunnage (L) [5% sodium hypochlorite and/or DCDMH/chloroform/t-butyl alcohol/water][b]	<50 mg/kg

Notes:
[a] These treatment levels are the analytical LOQs for these waste streams. Actual chemical agent levels in the treated waste streams are expected to be lower than these LOQ levels, and values will be reported below the LOQ.
[b] The treatment reagent used to establish the treatment level/limit is indicated in brackets.

4-2 WASTE ANALYSIS PLAN [40 CFR 264.13(b) and 270.14(b)(3); R315-3-5, 3-7, and R315-8-2.4]

The Rapid Response System glovebox WAP is designed to promote safe waste management practices at the Rapid Response System test site. The primary purpose of waste sampling and analysis is to ensure that wastes are properly characterized in compliance with RCRA requirements for general waste analysis (40 CFR 264.13; R315-8-2.4). The objectives of this WAP are to ensure safe handling, treatment, and disposition of all waste materials to be treated in the Rapid Response System and the resultant treatment residues; maintain operations within engineering control; establish uniform waste characterization; ensure that wastes accepted are in accordance with the RCRA Part A permit application and applicable RCRA regulations; and ensure treatment residues (neutralent waste streams and decontaminated dunnage waste streams) are properly managed offsite at an approved hazardous waste TSDF.

This WAP describes:

(1) The physical and chemical analyses that will be performed on hazardous wastes generated from treatment operations in the Rapid Response System glovebox system;
(2) The methods to be used to collect samples;
(3) The frequency of sampling/analysis;
(4) The methods to be used to analyze the samples;
(5) Quality assurance/quality control procedures; and
(6) The basis for generator knowledge.

The WAP will be modified under the following conditions:

- When routine test methods are changed.
- When waste streams or routine process operations are changed or modified, thus requiring a change in the parameters to be tested.
- When regulations affecting the WAP are changed.
- When the permit is modified or reissued.

During treatment operations at the Rapid Response System test site, this WAP will be kept onsite with the Rapid Response System operating log. After operations cease, this WAP and associated documents will be maintained for a period of at least 5 years at the Deseret Chemical Depot Environmental Management Division.

The Rapid Response System glovebox WAP is further described in the following sections. Section 4-2a describes the parameters for waste characterization, the rationale for their selection, the waste acceptance criteria, and waste acceptance process in the Rapid Response System glovebox. Sections 4-2b and 4-2c describe the testing and sampling methods, respectively, for wastes to be treated in the Rapid Response System glovebox. Section 4-2d presents the frequency at which the initial waste characterization analysis will be performed. Section 4-2e identifies additional requirements for wastes generated offsite. Section 4-2f describes methods used to meet the additional requirements for ignitable, reactive, or incompatible wastes.

4-2a Parameters and Rationale [40 CFR 264.13(b)(1); R315-8-2.4]

Table 4-6 presents a summary of this entire WAP. For each waste stream specified, this table presents the selected analytical parameters and corresponding analytical methods, sampling frequencies, and sampling methods. The table is divided into two sections: (1) those wastes requiring onsite treatment and (2) treatment residues requiring offsite treatment/disposal.

The parameters used to characterize the materials to be treated in the glovebox will be selected to provide sufficient information to ensure:

- Compliance with applicable regulatory requirements
- Conformance with permit conditions
- Safe and effective waste management operations.

Waste Requiring Onsite Treatment

As discussed in Section 4-1, process knowledge, and visual examination during unpack operations. The use of the Raman spectrophotometer identification system, and engineering judgment will be used to characterize (1) CAIS chemical agents to be treated in the neutralization station of the Rapid Response System glovebox, and (2) chemical agent-contaminated dunnage to be treated in the unpack station of the glovebox. The U.S. Army is both the chemical agent manufacturer and the Rapid Response System designer/owner; therefore, the Rapid Response System glovebox treatment methods have been engineered specifically to treat chemical agent and chemical agent-contaminated dunnage. Attachment 2 provides details on the use of the Raman spectrophotometer identification system.

Treatment Residues/Wastes Requiring Offsite Treatment/Disposal

The treatment residues generated from Rapid Response System treatment operations will be characterized based on process knowledge, chemical agent analysis, and supporting analytical data obtained from bench-scale demonstrations conducted at ERDEC. This analytical data (generated from ERDEC) will be used to establish a baseline composition and characterization for the neutralent waste streams. In addition, a representative sample of each waste stream type generated from treatment operations will be collected and sent to a Utah-certified laboratory for full RCRA characterization.

As a result of chemical agent treatment, container failure, or other incidents, RCRA-regulated wastes (contaminated rags, wipes, spent decontamination solutions, etc.) may be generated in the Rapid Response System glovebox. Process knowledge and engineering judgment will be used to characterize these wastes. The composition of the wastes generated will be well known; therefore, no additional analysis will be needed. These wastes will be managed according to the applicable State and RCRA regulations, and will be sent offsite to an approved hazardous waste TSDF.

4-2b Test Methods [40 CFR 264.13(b)(2); R315-8-2.4]

Chemical Agent Identification Set Components Containing Chemical Agents. The chemical agents to be treated in the neutralization station of the Rapid Response System glovebox will be characterized based on a combination of process knowledge, supporting manufacturing and analytical data, engineering judgment, MSDSs, Raman spectrophotometer identification, and visual examination of container contents. The Rapid Response System Operator(s) will use as much information as required to identify and characterize each CAIS item.

The chemical agents were prepared to government standards and are well-defined wastes that will be treated under strict engineering and safety control. The chemical agent CAIS components will not be sampled prior to treatment because sufficient information is available from chemical agent manufacture, manufacturing specifications, and previous studies conducted to date. Appendix 4-1 of the permit application discusses in detail the CAIS item identification process. The United States Government standards for chemical agent may be referenced as necessary. Therefore, no additional waste analysis is necessary to accept the wastes in the Rapid Response System glovebox.

Further MSDS information about the chemical agents' compositions is presented in Appendix 4-2, and the potential chemical agent decomposition products, impurities, and reaction products are presented in Tables 4-1, 4-2, 4-3, and 4-4.

Neutralent Waste Streams. The neutralent waste streams (treatment residues) will be characterized prior to offsite shipment to a TSDF, based on process knowledge, ERDEC bench-scale demonstration analytical data, chemical agent analyses, and RCRA waste characterization analysis. The RED, BLUE, and CHARCOAL process neutralent waste streams will be sampled and analyzed for chemical agent to verify that the chemical agent concentration is below the treatment goal of 50 ppm and excess oxidant is present. Table 4-7 lists the test (analytical) methods and their references for the parameters identified in Table 4-6.

The physical state of these waste streams will be determined by process knowledge and visual examination. While the waste drum is under engineering controls, a representative liquid sample will be drawn from each drum for chemical agent analysis to be conducted at an approved agent laboratory. In cases where the Mobile Analytical Support Platform (MASP) is unavailable or unable to provide analytical screening of neutralent waste streams, the sample will be sent to an approved offsite laboratory for chemical agent screening. While awaiting test results, the waste drum will be stored in the less than 90 day temporary waste staging area and will be managed in accordance with R315-5-10 and R315-7-16 (40 CFR 262.34 and 265 Subpart I by reference and 40 CFR 265 Subpart CC). If chemical agent analytical results do not show successful treatment, the waste drum will be placed back under engineering controls and additional treatment reagent will be added to the liquid waste drum and sampling and analysis for chemical agent will be repeated until the treatment goal is met. Upon successful treatment, the drum will be placed in the less-than 90 day storage area and prepared for shipment offsite to a TSDF.

Table 4-6.
RRS Waste Analysis Plan Summary

Waste Stream	Analytical Parameters[a]	Analytical Methods[b]	Frequency of Analysis	Sampling Method
Waste Requiring Onsite Treatment:				
1. Chemical Agent	Generator knowledgec	--	--	--
2. Agent-contaminated Packaging Materials/Dunnage	Generator knowledgec	--		--
Treatment Residues Requiring Offsite Treatment/Disposal:				
1. RED Process Neutralent	Agent concentration	ERDEC[b] (GC/MS),	1 sample/drum generated	Drum Thief/COLIWASA
	Excess Oxidant	Starch-iodide Paper	1 sample/drum generated	
	Total Metals	6010B, 7471A, 7470A	1 sample/drum generated	
	Total Organics	8260B, 8270C	1 sample/drum generated	
	PH	9040B, 9045C	1 sample/drum generated	
	Ignitability	1010, 1020A	1 sample/drum generated	
	Btu	ASTM E-311/ASTM D-240	1 sample/drum generated	
	% Ash	ASTM E-830, ASTM D-482	1 sample/drum generated	
	Specific Gravity	ASTM D-4052	1 sample/drum generated	
2. BLUE Process Neutralent	Agent concentration	ERDEC[b] (GC/MS),	1 sample/drum generated	Drum Thief/COLIWASA
	Excess Oxidant	Starch-iodide Paper	1 sample/drum generated	
	Total Metals	6010B, 7471A, 7470A	1 sample/drum generated	
	Total Organics	8260B, 8270C	1 sample/drum generated	
	PH	9040B, 9045C	1 sample/drum generated	
	Ignitability	1010, 1020A	1 sample/drum generated	
	Btu	ASTM E-311/ASTM D-240	1 sample/drum generated	
	% Ash	ASTM E-830, ASTM D-482	1 sample/drum generated	
	Specific Gravity	ASTM D-4052	1 sample/drum generated	
3. CHARCOAL Process Neutralent	Agent concentration	ERDEC[d] (GC/MS),	1 sample/drum generated	Drum Thief/COLIWASA
	Excess Oxidant	Starch-iodide Paper	1 sample/drum generated	
	Total Metals	6010B, 7471A, 7470A	1 sample/drum generated	
	Total Organics	8260B, 8270C	1 sample/drum generated	
	PH	9040B, 9045C	1 sample/drum generated	
	Ignitability	1010, 1020A	1 sample/drum generated	
	Btu	ASTM E-311/ASTM D-240	1 sample/drum generated	
	% Ash	ASTM E-830, ASTM D-482	1 sample/drum generated	
	Specific Gravity	ASTM D-4052	1 sample/drum generated	

Table 4-6.
RRS Waste Analysis Plan Summary

Waste Stream	Analytical Parameters[a]	Analytical Methods[b]	Frequency of Analysis	Sampling Method
4. Decontaminated Dunnage/Packing Materials	Agent concentration	ERDEC[e] (GC/MS)	1 sample/drum generated	Scoop/Drum Thief/Hand selection
	Total Metals	6010B, 7471A, 7470A	1st 5 drums generated, every tenth drum thereafter	
	Total Organics	8260B, 8270C	1st 5 drums generated, every tenth drum thereafter	
	Btu	ASTM E-311/ASTM D-240	1st drum generated, every tenth drum thereafter	
	% Ash	ASTM E-830, ASTM D-482	1st drum generated, every tenth drum thereafter	
	Free Liquids	9095	1st drum generated, every tenth drum thereafter	

Notes:

a For onsite waste treatment, the analytical parameter of "generator knowledge" is used because there is a good deal of information available on CAIS items from the time of manufacture, as well as the ability of the Raman spectrophotometer to nonintrusively determine the contents of CAIS items. Rationale for the selection of the offsite waste treatment analytical parameters is intended to satisfy the requirements of 40 CFR 268.42.

b Analytical methods include those specific to agent analysis at ERDEC, EPA methods, ASTM methods, and SW-846 methods.

c Generator knowledge will be used in lieu of sampling and analysis to characterize the chemical agents before treatment.

d Qualitative method using an extraction procedure or other sample preparation methods using gas chromatography techniques. ERDEC. Reference report: *Development and Performance Testing of a Chemical Analysis Method for Sulfur Mustard (HD), Nitrogen Mustard (HN—1), and Lewisite (L) in Rapid Response System (RRS) Neutralization Solutions,* June 1997.

e Decontaminated dunnage agent analysis will be conducted using an extraction procedure following SW-846 guidance, followed by the same methodology used for analyzing the liquid neutralents.

Note 1: Analytical methods will be selected in cooperation with the analytical laboratory certified by the State of Utah. Any "equivalent" methods must be approved by the Executive Secretary prior to use.

GC/MS = gas chromatograph/mass spectrometer

Decontaminated Dunnage Waste Streams. Process knowledge and chemical agent analytical data will be used to characterize the decontaminated dunnage waste streams. After the appropriate decontamination solution is added to the chemical agent-contaminated dunnage, the decontaminated dunnage waste streams (treatment residues) will be sampled and analyzed for chemical agent to verify effective treatment of chemical agent. A representative sample will be collected. The physical state of this waste stream will be determined by process knowledge and visual examination. Once the dunnage waste stream has been decontaminated, a representative sample will be collected in a manner consistent with American Society for Testing and Materials (ASTM) standard D-6051-96, Composite Sampling and Field Subsampling for Environmental/Waste Management Activities. The representative sample will be analyzed for the presence of chemical agent. The sample will contain each type of material in the matrix (such as metal shavings, vermiculite, cardboard, and glass). The chemical agent analysis (on a representative sample) will be conducted at an approved chemical agent laboratory. If chemical agent analytical results do not show successful treatment, additional decontamination solution will be added to the solids drum and the sampling and analysis for chemical agent will be repeated, as necessary.

All chemical agent analyses will be performed at an approved agent laboratory by qualified chemists and technicians according to standard operating procedures and the Quality Control Plan (QCP). All samples will be inventoried and logged appropriately, according to the QCP, in the Rapid Response System operating record.

The effectiveness of treatment of chemical agent and chemical agent-contaminated dunnage will be confirmed by chemical agent analyses on representative samples of the treatment residues. Treatment will be considered effective and complete upon the successful oxidation of chemical agent to the Army-established treatment goal of less than 50 ppm. Verification activities will be performed after each waste drum is full or will no longer be used for accumulation. The Rapid Response System operator(s) will visually inspect the waste drum to determine its fill level, as well as using their knowledge of the number of treatment reactions run and the volume of waste generated from each reaction.

The test methods used for chemical agent analyses of the treatment residues are shown in Table 4-7. Table 4-8 presents the instrumentation that will be used to determine treatment effectiveness. Non-agent related analyses that may be performed on the neutralent and decontaminated dunnage waste streams will be in accordance with the Environmental Protection Agency's (EPA's) Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, current edition, or other EPA-recognized methods; and will be performed at a Utah-certified laboratory.

4-2c Sampling Methods [40 CFR 261, Appendix I, and 264.13(b)(3); R315-50-6]

Chemical agent CAIS components will not be sampled and analyzed prior to treatment in the Rapid Response System glovebox. Process knowledge, MSDSs, and supporting laboratory data from analysis of similar materials will be used to characterize the chemical agents in lieu of sampling and analysis.

Table 4-9 lists the type of equipment and sampling methods, where appropriate, that will be used to obtain a representative sample of each treatment residue (neutralent and decontaminated dunnage waste streams). Methods used to obtain a representative sample are consistent with the sampling protocols of SW-846, current edition. For each waste stream sampled, one representative sample, plus appropriate quality assurance/quality control (QA/QC) samples, will be collected for each sampling event. Where applicable, methods for representative sampling are listed in Table 4-9. (Refer to Section 4-2g for QA/QC protocols.)

Neutralent Waste Streams. Drums containing a liquid neutralent waste stream will be sampled for chemical agent analysis using appropriate equipment, such as a drum thief or Coliwasa. The liquid waste drum will be connected to the glovebox system (under engineering control) while sampling for chemical agent analysis is conducted. This procedure will prevent personnel exposure to possible chemical agent vapors.

The liquid waste will be agitated prior to removal of the sample to ensure homogeneity of the sample. Approximately 50 milliliters of the liquid neutralent will be taken as a representative sample for chemical agent analysis. The representative sample will be placed into an appropriate sample bottle and sealed. Once sampling has concluded, the drum thief/Coliwasa will be placed into the liquid neutralent waste drum.

Further sampling and analysis (non-agent) may be conducted (1) upon request from environmental authorities, (2) if the treatment processes change, or (3) if the treatment wastes are differing from what is expected. See Table 4-6 for the non-agent compounds for which neutralent is tested. Upon request, 1-quart "fingerprinting" samples will be taken using a Coliwasa or drum thief for waste profiling and acceptance purposes at an approved hazardous waste TSDF. These samples will be released once the chemical agent analytical results show that the agent concentration is below 50 ppm. The samples will be representative and reflect all variabilities inherent in the generation process.

Waste profiles will be prepared by the operator and will be approved by the Deseret Chemical Depot Environmental Division. The waste profiles (which include the waste chemical and physical properties, process of generation, packaging, waste codes, and site information) will accompany these "fingerprinting" samples to the approved hazardous waste TSDF.

A sampling and analysis QA/QC program will be followed when sampling and analyzing the neutralent waste streams. Details of this program are described in Section 4-2g and in the Rapid Response System QCP.

Table 4-7.
Test Methods for RRS Treatment Residues

PARAMETER	TEST METHOD[a]	REFERENCE[b]
Sulfur Mustard	Gas Chromatograph/Mass Spectrometer	Note 1
Nitrogen Mustard	Gas Chromatograph/Mass Spectrometer	Note 1
Lewisite	Gas Chromatograph/Mass Spectrometer	Note 1
Dunnage w/Sulfur Mustard Contamination	Gas Chromatograph/Mass Spectrometer	----[c]
Dunnage w/Nitrogen Mustard Contamination	Gas Chromatograph/Mass Spectrometer	----[c]
Dunnage w/Lewisite Contamination	Gas Chromatograph/Mass Spectrometer	----[c]
Excess Oxidant	Starch-iodide Paper	----[c]
Physical State	Process knowledge and/or visual inspection	EPA SW 846
pH[c]	electronometric	EPA SW 846
Free Liquids[d]	Paint Filter Liquids Test	EPA SW 846
Ignitability[d]	Setaflash - closed cup mehtod and/or Pensky-Martens-Closed Cup Method	EPA SW 846
Btu[d]	Heat of Combustion	ASTM
%Ash[d]		ASTM
Specific Gravity[d]		ASTM
Total Metals[d]		
Arsenic	Atomic absorption-gaseous hydride	EPA SW 846
Barium	Atomic absorption-direct aspiration	EPA SW 846
Cadmium	Atomic absorption-direct aspiration	EPA SW 846
Chromium	Atomic absorption-direct aspiration	EPA SW 846
Lead	Atomic absorption-direct aspiration	EPA SW 846
Mercury	Manual cold vapor technique	EPA SW 846
Selenium	Atomic Absorption-gaseous hydride	EPA SW 846
Silver	Atomic absorption-direct aspiration	EPA SW 846
PARAMETER	**TEST METHOD[a]**	**REFERENCE[b]**
Total Organics[d]	Gas chromatograph/mass spechtrometer	8270C/8260B

NOTES:

Note 1: Quantitative method using an extraction procedure or other sample preparation mehtods using gas chromatography techniques. ERDEC. Reference report: *Development and Performance Testing of a Chemical Analysis Method for Sulfr Mustard (HD), Nitrogen Mustard (HN-1), and Lewisite (L) in Rapid Response System (RRS) Neutralization Solutions, June 1997*.

Note 2: The laboratory must be certified by the State of Utah for all analytical methods used. Any "equivalent" methods must be approved by the Executive Secretary prior to use.

[a] Samples shall be analyzed at a Utah-certified laboratory, or in the case of ehcmical agent analysis, an Army certified agent Laboratory.

[b] Analytical methods are as listed in Table 4-6.

[c] Decontaminated dunnage agent analysis will be documented using an extraction procedure following SW-846 guidance, followed by the same methodology used for analyzing the liquid wastes.

[d] These parameters may apply to additional analyses to be prformed on the neutralent waste streams for TSDF approval and acceptance purposes.

ASTM = American Society for Testing and Materials
EPA = Environmental Protection Agency

Table 4-8.
Instrumentation Used to Determine Treatment Effectiveness

Parameter	Instrumentation
Chemical Agent Analysis:	
Sulfur Mustard	Gas Chromatograph/Mass Spectrometer
Nitrogen Mustard	Gas Chromatograph/Mass Spectrometer
Lewisite	Gas Chromatograph/Mass Spectrometer
Chemical Agent-Contaminated Dunnage[a]	Gas Chromatograph/Mass Spectrometer
Excess Oxidant	Starch Iodide Paper

Note:
[a] The same test method will be used to determine treatment effectiveness for the chemical agent/industrial chemical-contaminated dunnage waste stream.

Table 4-9.
Sampling Methods for RRS Treatment Residues[a]

Treatment Residue Description	Chemical Analysis	Sampling Equipment [b]
RED Process Neutralent	• Chemical Agent	Coliwasa/Drum Thief
BLUE Process Neutralent	• Chemical Agent	Coliwasa/Drum Thief
CHARCOAL/CHARCOAL "L" Process Neutralent	• Chemical Agent	Coliwasa/Drum Thief
Decontaminated Dunnage	• Chemical Agent	Drum Thief/Scoop

Notes:
[a] Additional non-agent analysis shall be completed at a Utah-certified laboratory for waste characterization.
[b] Sampling methods used will be consistent with sampling protocols in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition.

Coliwasa = Composite Liquid Waste Sampler

Decontaminated Dunnage. The decontaminated dunnage may be sampled in one of two ways depending on where the treatment occurs. If the material is treated in the unpack station catch tray, a representative sample will be collected before the material is placed into the solids drum (which is in the waste containerization system under the unpack station). The sample will contain each media type (for example, glass, metal parts, absorbent, rags, etc.) represented in the waste stream. If the treatment occurs in the solids drum, a representative grab sample will be taken in accordance with SW-846 guidance and will include both the liquid and solid phases. A drum thief may be used to obtain the liquid portion of the sample, and a scoop may be used to obtain the different solid media types.

Upon request, a representative sample will be taken for hazardous waste TSDF approval purposes. These samples will not be taken until chemical agent analytical results show successful treatment (agent concentration less than 50 parts per million). Waste profiles will accompany these samples to the TSDF.

A sampling and analysis QA/QC program will be followed when sampling and analyzing this waste stream. Details are provided in Section 4-2g. The QCP will be followed for chemical agent analyses.

4-2d Frequency of Analysis [40 CFR 264.13(b)(4); R315-8-2.4]

Waste analyses will be repeated any time a process, material, or equipment change occurs that could cause a change in the waste composition of the treatment residues. Annual analysis will be necessary if the Rapid Response System treatment operations are not completed within one year of commencement. The chemical agent CAIS components will not be sampled and analyzed prior to treatment in the Rapid Response System glovebox.

Table 4-6 outlines the frequency of analyses for each of the waste parameters that have been identified in Section 4-2a for the Rapid Response System treatment residues. Treatment effectiveness will be confirmed for each drum of neutralent and decontaminated dunnage generated as specified in Table 4-8.

Waste characterization may be required more frequently under the following circumstances:

- A non-routine waste stream is generated from the decontamination operations [refer to Attachment 2];
- The routine process generating the neutralent waste stream changes; or
- Request for sampling and analysis from an environmental regulatory authority (for example, Utah Division of Solid and Hazardous Waste, EPA).

4-2e Additional Requirements for Wastes Generated Offsite [40 CFR 264.13(c); R315-8-2.4]

All CAIS materiel planned for Rapid Response System treatment is currently stored onsite at Deseret Chemical Depot.

4-2f Additional Requirements for Ignitable, Reactive, or Incompatible Wastes [40 CFR 264.13(b)(6) and 264.17; R315-8-2.4 and R315-8-2.8]

The waste characterization information on the chemical agents to be treated is well documented. The chemical agents accepted for treatment will be compatible with the treatment reagents, general purpose decontamination solution, catch trays, reactor in the neutralization station, and the approved drums/containers, due to the fact that the Rapid Response System glovebox system was designed specifically to treat chemical agents and chemical agent-contaminated media.

Compliance with the regulatory requirements for handling ignitable, reactive, or incompatible wastes is addressed in Section F-5 of the permit application.

4-2g Sampling and Analysis Quality Assurance/Quality Control Procedures

This QA/QC Plan discussion focuses on non-chemical agent analysis requirements. QA/QC requirements relating to chemical agent monitoring and analysis are provided in the Rapid Response System QCP. Samples may be sent for RCRA waste characterization analyses at a contracted Utah-certified laboratory.

This QA/QC Plan establishes the requirements that will be followed to ensure waste sampling and analysis objectives are met and that all data obtained are technically sound, statistically valid, and properly documented. This QA/QC Plan also identifies the tools that will be used to measure the degree of certainty that all objectives have been met.

4-2g(1) Quality Assurance/Quality Control Objectives

The objectives of the Rapid Response System waste sampling and analysis QA/QC program are two-fold. The first objective is to control and characterize any errors associated with the collected data. QA activities, such as the use of standard procedures for locating and collecting samples, are intended to limit the introduction of error. QC activities, such as the collection of duplicate samples and the inclusion of blanks in sample sets, are intended to provide the information required to characterize any errors in the data. Other QC activities, such as planning the QC program and auditing ongoing and completed activities, ensure that the specified procedures are followed and that the QA information needed for characterizing error is obtained.

The second QA/QC objective is to confirm that waste sampling and analysis has been conducted according to the specifications of the Rapid Response System WAP and requirements of this QA/QC Plan. QA/QC activities will include:

- Field inspections--performed by the QA Officer or designee, depending on the activity. The inspections will be primarily visual examinations but may include measurements of materials and equipment used techniques employed, and the final products. The purpose of these inspections is to verify that a specific guideline, specification, or procedure for the activity is successfully completed.

- Field testing--performed onsite by the QA Officer or designee according to specified procedures.

- Laboratory analyses--performed by an approved laboratory (chemical agent analyses) or a contracted Utah-certified laboratory (non-agent analyses) on samples of waste. The purpose of laboratory analyses is to determine constituents or characteristics present and their concentration levels.

- Checklist preparation--required for critical inspection. Checklists are to be filled out during the course of inspections to document the results.

- Instrument calibration--maintain records of calibration of all instruments used to perform waste sampling and laboratory analyses.

4-2g(2) Data Quality Objectives

The data quality objectives (DQOs) for waste sampling and analysis will include, but not be limited to, the following:

Sampling and Analysis Objectives. DQOs for the waste sampling and associated data analyses are as follows:

- Determine if waste samples are representative of the contents of the containers at the time the samples were taken;
- Determine if waste to be accepted for treatment is within the Rapid Response System RCRA permit application limitations; and
- Characterize wastes that will be sent offsite to an approved hazardous waste TSDF.

Data Collection/Sampling Objectives. The acquired data must be scientifically sound, of known quality, and thoroughly documented. The DQOs for the data assessment shall be used to determine compliance with the following National Quality Standards, which address the EPA's DQOs:

- o *Precision.* Precision will be the agreement between the collected samples (duplicates) for the same parameters, at the same location, and from the same collection vessel.
- o *Accuracy.* Accuracy will be the agreement between the amount of a component measured and the amount of the component actually present.
- o *Representativeness.* Representativeness will address the degree to which the data accurately and precisely represent a real characterization of the population, parameter variation at a sampling point, sampling conditions, and the environmental conditions at the time of sampling. The issue of representativeness shall be addressed for the following points:
  - Based on the generation process, the waste stream, and its volume, an adequate number of sampling locations are selected.
  - The representativeness of selected media has been accurately defined.
  - The sampling and analytical methodologies are appropriate.
  - The environmental conditions at the time of sampling are documented.
- o *Completeness.* Completeness shall be defined as the ability of the sampling and analytical methodologies to accurately measure the contaminants present in the waste.
- o *Comparability.* Comparability of the data generated shall be defined as the data that are gathered using standardized sampling methods, standardized analysis methods, and quality-controlled data reduction and validation methods.

4-2g(3) Sampling Quality Assurance/Quality Control

Sampling methods used to characterize wastes at the Rapid Response System test site will be those specified in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition; *American Society for Testing and Materials (ASTM) methods*; or other EPA-recognized methods. These sampling methods are summarized in Table 4-9. Container requirements, preservation requirements, and holding times for liquid samples and solid samples are listed in Tables 4-10 and 4-11, respectively.

The basic sampling procedure will be as follows:

- o Obtain samples using a pre-cleaned or disposable sampler;
- o Fill sample containers;
- o Label sample containers;
- o Properly clean and decontaminate sample containers and the sampling hardware (if necessary);
- o Custody-seal and blister-wrap all sample containers, place wrapped containers in a leak tight polyethylene bag, and place samples in a durable ice-filled cooler or comparable receptacle for transport to the laboratory;
- o Complete the chain-of-custody and request-for-analysis forms;
- o Review all paperwork and enclose the forms in a leak tight polyethylene bag taped to the underside of the cooler lid;
- o Seal and mark the coolers or comparable receptacles in accordance with DOT requirements; and
- o Transport coolers to the analytical laboratory.

Sample Container Preservation, Handling, and Management. Sample container selection is critical to sample quality. Considering waste compatibility, durability, volume, and analytical sensitivities, the containers listed in Table 4-10 are recommended for liquid sampling efforts and Table 4-11 for solid sampling efforts.

All samples are labeled with at least the following information:

- A unique alphanumeric identifier;
- Notation of sample collection;
- Date and time of collection;
- Sample collector's name;
- Preservatives used; and
- Analyses requested.

Samples for chemical agent analysis will be collected after treatment, before the drum is removed from the glovebox system. Immediately after collection, filled sample containers will be placed on ice, if necessary, in durable coolers or comparable receptacles for transport to the laboratory, if appropriate. All samples sent offsite for analysis will be packaged in accordance with the requirements of the receiving laboratory and the DOT guidelines. At the approved agent laboratory, the samples will be analyzed for chemical agent concentration. All other non-agent analyses (RCRA characterization) that may be conducted will be performed at a contracted Utah-certified laboratory. These samples will not be released for RCRA characterization until the chemical agent analytical results show chemical agent below 50 ppm.

Before shipping, if samples are to be sent offsite, coolers or comparable receptacles will be tightly sealed with duct tape and custody-sealed along the front and back edges of the lids. Samples transported to offsite laboratories for RCRA analysis will be shipped via overnight courier. No samples will be transported for RCRA analysis in this way unless chemical agent analysis has shown that the chemical agent concentration is below the approved treatment goal of 50 ppm. Should the MASP become inoperable, DOT regulations will be observed in transporting the sample to ERDEC or other approved agent laboratory to perform the agent screening analysis. All sample collection, preparation, packaging, transportation, and analysis will conform to the requirements of SW-846, current edition; DOT guidelines; and the Rapid Response System QCP.

Sampling procedures are designed to ensure that each sample will be accounted for at all times. The primary objectives of the sample control procedures are as follows:

- Each sample collected for analysis will be uniquely identified.
- Important and necessary sample constituents will be preserved (for example; refrigerated, capped).
- Samples will be protected from loss, damage, or tampering.
- Any alteration of samples during collection or shipping (for example; preservation, breakage) will be documented.
- A record of sample custody and integrity will be established that will satisfy legal scrutiny.
- The correct samples will be analyzed and will be traceable to the applicable data records (for example, chain-of-custody, field records, request for analysis, laboratory ledgers).

Sample collectors will maintain a permanent record of sampling activities. At a minimum, the record will include the following: purpose of sampling, date and time of collection, sample number, sampling location, sampling methodology, container description, waste description, description of process originating the waste, name and address of field contact, number and volume of samples, field observations, field measurements, destination and transporter, and signature of collector.

Transportation of samples will be in accordance with DOT, EPA, and Army requirements. Hazardous waste samples will be properly packaged, marked, and labeled. Shipping papers will be prepared as required by DOT regulations, EPA requirements, and Army regulations and guidelines.

All equipment used to sample waste materials will be disposable or designed for easy decontamination. Contaminated disposable equipment will be managed as hazardous waste. Cleanable equipment will be thoroughly decontaminated prior to reuse. Spent decontamination solutions will be managed as hazardous waste.

Table 4-10.
Minimum Sample Requirements for Aqueous Samples

Parameter	Method	Holding Time[a]	Bottle Type	Preservative	Standard Volume[b]	Minimum Volume
Chemical Agent	RRS Method	30 Days	Glass	4°C	50 mL	20 mL
Metals	6010B	180 Days	HDPE Plastic	pH < 2, HNO^3, 4°C	1L	50mL
Mercury	7470A	28 Days	HDPE Plastic	pH < 2, HNO^3, 4°C	500mL	50mL
Volatiles	8260B	14 Days	Amber Glass	pH < 2, HCl, 4°C	2 x 40mL	40mL
Semivolatiles	8270C	7 Days Extraction/40 Days Analysis	Amber Glass	4°C	2 x 1L	500mL
Corrosivity/pH	9040B	Analyze Immediately	HDPE Plastic	4°C	250mL	50mL
Ignitablilty	1010	7 Days	Glass	None	500mL	100mL
BTU, Heat of Combustion	ASTM D-240	None	Plastic	None	1L	1L
%Ash	ASTM D482	None	Plastic	None	1L	1L
Specific Gravity	ASTM D-4052	None	Plastic	None	1L	1L

Notes: [a] Holding times are from the date of collection as referred to in Federal Register, Vol. 49, No. 209, October 26, 1984, as applicable.
[b] One sample for full quality control is required for each project or for every 20 samples, whichever is greatest.

Table 4-11.
Minimum Sample Requirements for Non-Aqueous Liquid and Solid Samples

Parameter	Method	Holding Time[a]	Bottle Type	Preservative	Standard Volume[b]	Minimum Volume
Chemical Agent	RRS Method	30 Days	Glass	4°C	50 mL	20mL
Metals	6010B	180 Days	HDPE Plastic	4°C	100g	5g
Mercury	7471A	28 Days	HDPE Plastic	4°C	100g	5g
Volatiles	8260B	14 Days	Amber Glass	4°C	100g	10g
Semivolatiles	8270C	14 Days Extraction/40 Days Analysis	Amber Glass	4°C	100g	30g
pH	9045C	Analyze Immediately	HDPE Plastic	4°C	50g	5g
Ignitablilty	1020A	7 Days	Glass	None	100g	30g
BTU, Heat of Combustion	ASTM E-711	None	Plastic	None	1000g	300g
%Ash	ASTM E-830	None	Plastic	None	1000g	300g
Specific Gravity	ASTM D-4052	None	Plastic	None	1L	1L

Notes: [a] Holding times are from the date of collection as referred to in Federal Register, Vol. 49, No. 209, October 26, 1984, as applicable.
[b] One sample for full quality control is required for each project or for every 20 samples, whichever is greatest.

Chain-of-Custody. A chain-of-custody record will accompany samples at all times. A chain-of-custody record form will be used to document sample collection activities, including sampling site, sample identification, number of samples, and date and time of collection. Additionally, the form will document the chain-of-custody including names of responsible individuals and dates and times of custody transfers.

Chain-of-custody documentation for samples will continue throughout the analytical process. An example of a chain-of-custody form is provided in Figure 4-1. After logging in samples and storing them, the sample custodian will distribute sample-receiving logs, which list sample numbers and analyses to be performed, to the appropriate analysts and technical leaders. Upon completion of analyses, results will be submitted to the approved agent laboratory data management organization along with QA/QC information.

Field QA/QC. Internal QA/QC checks will be established by submitting QA and QC samples to the analytical laboratory. The types and frequency of field QC sample collection are:

- *Field Blanks.* Defined as samples of ASTM Type II (or other high purity) water from the same source of water as used for decontamination. One field blank will be prepared for each sampling event and analyzed for the same analyses as the samples collected that day. At a minimum, one field blank will be taken for each day of sampling. Field blanks are prepared and preserved using sample containers from the same lot as the other samples collected that day. Results of the field blank analyses will help determine the level of contamination introduced into the sample due to sampling technique and as a check of the water used for decontamination.

- *Field Replicates.* Defined as independent samples collected in such a manner that they are equally representative of the variables of interest at a given point in space and time. The number of field replicate samples will be approximately 5 percent (1 in 20) of the total number of field samples taken or 1 per day, whichever is more frequent. The laboratory will use the field replicates as laboratory replicates and/or matrix spikes. Thus, for the replicate sample, there will be the normal sample analysis, the field replicate, and the laboratory replicate. Replicate samples will provide an estimate of sampling precision.

Health and Safety Protocols. During all sampling activities, strict compliance with industrial hygiene and safety standards will be mandatory. Personnel will be required to wear eye, skin, and respiratory protection gear, as dictated by safety personnel. If personnel accidentally contact waste material, decontamination procedures are performed as directed by safety personnel.

CHAIN OF CUSTODY RECORD

Generator Name, Address :				
Project No./ID :			**Sheet 1 of**	
Sampled By :		**Bottles Supplied By :**		
Preservative used :				
NOTE: When samples are received, return this form to:				
	Name :		**At the above address.**	

Sample I.D.	Sample Description/Location	Collection Date/Time	Number Of Bottles	Analyses Requested

Sample received and packed by: _____ Date/Time: _____
Cooler/Box Identifier: _____ Method of Shipment: _____
Date of Shipment: _____ Airbill No. _____

Laboratory Name: _____
Received by: _____ Date/Time: _____
Seals Intact (Y/N): _____ Containers Intact (Y/N): _____
If not intact, please describe in comments section.

NOTE: Laboratory's chain of custody procedures are in effect from receipt through analysis.

SAMPLES RELINQUISHED BY:			SAMPLES RECEIVED BY:			SAMPLES INTACT
Signature	**Date**	**Time**	**Signature**	**Date**	**Time**	

Comments: _____

_____

Figure 4-1.
Example of a Chain of Custody Record

4-2g(4) Laboratory Quality Assurance/Quality Control

An analytical laboratory must conduct its operations in such a way as to provide reliable information. An approved agent laboratory will be used for chemical agent analyses, and a contracted Utah-certified laboratory will be used for all other non-agent analyses that may be conducted on the neutralent and decontaminated dunnage waste streams (treatment residues).

The QA/QC of data generated by both onsite and offsite analytical laboratories is controlled by the Rapid Response System QCP. The purpose of the QCP is to support the requirements of the Quality Assurance Program Plan for chemical agent analysis and monitoring. At a minimum, the QCP documents the following:

- Sample custody and management practices
- Sample preparation and analytical procedures
- Instrument maintenance and calibration procedures
- Internal QA/QC measures including the use of method blanks.

General analytical QA/QC activities will include:

- *Laboratory Analyses.* Performed by onsite or offsite laboratories on samples of waste. The purpose of the laboratory analyses is to determine constituents or characteristics present and their concentration or level. The date and time of all extractions and analysis will be reported with the analytical results.

- *Checklist Preparation.* Required for critical inspections. Checklists are to be filled out during the course of any inspections to document inspection results.

- *Instrument Calibration.* Maintains records of calibration of all instruments used to perform surveying, field testing, and laboratory analyses.

Laboratory analysis of QC standards provides an ongoing internal audit of methods performance. Types of internal quality control checks include:

- *Method Blanks:* Usually consist of laboratory reagent-grade water treated in the same manner as the sample (that is, digested, extracted, distilled, etc.), which is then analyzed and reported as appropriate. For solids, an appropriate matrix such as diatomaceous earth shall be used.

- *Method Blank Spike:* A sample of laboratory reagent-grade solvent fortified (spiked) with the analytes of interest, which is prepared and analyzed with the associated sample batch

- *Laboratory Control Sample for Inorganics:* A standard matrix with a certified concentration that is analyzed as a sample and used to monitor analytical accuracy (equivalent to a method blank spike).

- *Matrix spike/matrix spike duplicates:* An aliquot of an investigative sample that is fortified (spiked) with a known quantity of the analytes of interests and is then analyzed with an associated sample batch to monitor the effects of the investigative sample matrix (matrix effects) on the analytical method. Matrix spike/matrix spike duplicates are performed on 5 percent of the samples (1 in 20) or one per batch of samples, whichever is greater.

- *Laboratory Duplicate Samples:* Obtained by splitting a field sample into two separate aliquots and performing two separate analyses on the aliquots. The analysis of laboratory duplicates monitors the precision of the analytical method for the sample matrix, as well as the homogeneity of the sample, particularly in the case of nonaqueous samples. Laboratory duplicates are performed on 5 percent of the samples (1 in 20) or one per batch of samples, whichever is greater. If the precision value exceeds the control limit, the sample set must be reanalyzed for the parameter in question.

- *Known QC Check Sample:* A reference QC sample as denoted by SW-846 of known concentration, obtained from the EPA, the National Institute of Standards and Technology, or an EPA-approved commercial source. This QC sample is used to check the accuracy of an analytical procedure. It is particularly applicable when a minor revision or adjustment has been made to an analytical procedure or instrument. The results of a QC check standard analysis are compared with the true values and the percent recovery of the check standard calculated.

Preventive Maintenance. Preventive maintenance procedures are intended to prevent instrument malfunctions and detect as early as possible any potential problems with the analytical equipment that might result in inaccurate analyses. Analytical instruments or instrument systems will undergo routine preventive maintenance as recommended by the vendor or manufacturer, or if such maintenance is warranted based on equipment operating experience. The determination of maintenance procedures and frequencies will be the responsibility of the individual laboratory. Maintenance and repair records will be maintained on all instruments and instrument systems, as required.

Routine Assessment of Precision, Accuracy, and Comparability of Analytical Data. Quality assurance for analytical data from collected samples includes evaluation of precision, accuracy, and comparability. These are discussed below.

Precision. Precision in reference to laboratory analysis is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is assessed by means of laboratory duplicate/field replicate sample analysis. The laboratory objective for precision is to be within the control limits for the analytical methods as published for the EPA-recognized methods or Army-approved methods (for chemical agent analyses), or as established by the laboratory for the modified or alternative methods.

Precision of the chemical laboratory data will be measured through the use of duplicate samples and calculated as the percent relative standard deviation (%RSD). The standard deviation, s, is calculated from the variance, s^2, as follows:

$$s^2 = \frac{(\bar{x} \; x_i)^2}{n \; 1}$$

where $\underline{x}$ is the mean value of a variable, x_i is the value of an individual measurement of a variable, and n is the number of data points and s is obtained from:

$$s = (s^2)^{1/2}$$

The %*RSD* is then:

$$\% \; RSD = s \; / \; \bar{x} * 100\%$$

The standard deviation and %RSD are calculated for every contaminant measured.

Accuracy. Accuracy represents the nearness of a result, or the mean of a set of results, to the true value. Accuracy will be assessed by means of reference samples and percent recoveries. The laboratory objective for accuracy is to be within the control limits for the analytical methods as published for the EPA-recognized method or Army-approved methods, or as established by the laboratory. Data Quality Objectives will be specified in Table 2-1 in Appendix 3 to the Waste Analysis Plan.

Accuracy of laboratory data will be assessed through the calculation of percent recovery from any certified standards that the laboratory analyses as part of its ongoing QA/QC program. The percent recovery is calculated as follows:

$$\% Recovery = \frac{SSR \; SR}{SA} x 100\%$$

where SSR is the spiked sample result, SR is the sample result, and SA is the spike added to the sample. The laboratory will also be required to run a sufficient number of blanks to detect laboratory contamination.

Comparability. All data will be reported in units consistent with the conventions used for the given analyte and methods employed. The results of analyses can then be compared with analyses from other laboratories because of the following project comparability objectives:

- Use standard methodology
- Report results from similar matrices in consistent units
- Apply appropriate levels of QC within the context of the laboratory's QA program.

Corrective Action. Corrective action will be initiated through the development and implementation of routine internal QC checks. Corrective action will be initiated by the laboratory QA/QC Officer when required to ensure data quality meets the criteria established in the laboratory QA plan. Corrective action of QA activities will be initiated by the Laboratory Manager in response to performance audits, system audits, comparison studies, or QA program audits.

Standard laboratory-initiated corrective actions consist of checking instruments, apparatus, obtaining new reagents and/or standards, and calibration verification or recalibration. If standard laboratory-initiated corrective actions do not identify and correct the problem, then instrument custodians, instrument system specialists, method authors, or chemist will troubleshoot and repair or correct the system performance.

General Approach to Corrective Action. For either immediate or long-term corrective actions, steps comprising a closed loop corrective action system will be as follows: (1) define the problem, (2) assign responsibility for investigating the problem, (3) investigate and determine the cause of the problem, (4) determine a corrective action to eliminate the problem, (5) assign and accept responsibility for implementing the corrective action, (6) implement the correction and determine its effectiveness, and (7) verify that the corrective action has eliminated the problem.

Precision. Undesirable performance or analytical errors will be identified as a problem in precision or bias. Either the results of replicate measurements were not in close agreement or the results were not in agreement with the expected (target) or reference values. Also, there is a possibility that both situations will occur concurrently. Rules for finding and resolving the causes of these deficiencies are not well established. However, the approach that the analyst takes must be systematic and based on common knowledge and experience of the laboratory personnel. A team effort from the analysts, the immediate supervisor, and the laboratory manager will be required. The most obvious causes are to be eliminated first. If the initial investigation does not resolve the problem, the attention is to be directed to the more complex possibilities.

Obvious analytical errors are transposition and transcription errors of data, the use of incorrect calculations or calculation errors, incorrect readings and recording of instruments readouts, the use of the wrong analytical procedures, and the lack of attentiveness to details in the laboratory will lead to imprecision or bias. A review and internal audit of the data and a detailed discussion with the analysts concerning how and when they performed specific steps in the laboratory procedures may indicate the cause of, and a corrective action for, the deficiency.

Bias. Inexperience of the analyst, instrument instability, variable contamination in the samples, variability of the method blanks, poor reagent quality and control, or fluctuations of the laboratory environment are possible causes of bias. Approaches to resolving these causes will be the following: (1) check for obvious and simple errors first, (2) repeat the analysis at the point where the sample is first introduced into the analytical procedure, (3) repeat the analysis on a different instrument or use another gas chromatograph (GC) column, and (4) have another analyst repeat the analysis.

Accuracy. Incorrect calibrations, losses of analyte during sample preparation or analysis, incorrect calibration standards, stock solutions, innate bias of the analyst, matrix effects on the analyte, instrumental shifts or instrument not calibrated, and contaminations in the sample or standards are possible causes of inaccuracy. Approaches to resolving these causes will be the following: (1) check for the obvious and simple errors first; (2) repeat the analysis at the point where the sample is first introduced into the analytical procedure; (3) repeat the analysis with new calibration standards; (4) recalibrate the analytical instrument; (5) repeat the analysis on another instrument that is calibrated; (6) have another analyst repeat the analysis; (7) repeat the analysis with fresh or new samples, if possible; and (8) check analytical instrument and detector.

QA Reports to Management. Periodic QA reports will be generated by each laboratory to document the analytical results and organizational performance. These reports will contain, at a minimum, reports of system or performance audits; reports of required corrective actions implemented; assessment of the generated data precision, accuracy, and comparability; and resolution of previously reported problems. The content, frequency, and recipient of these reports are established in the laboratory's Quality Assurance Plan.

4-2g(5) Recordkeeping

The approved agent laboratory will maintain a record system that will include the documentation of all samples received, analyzed, analyses conducted, preparations, QC challenges, maintenance of laboratory equipment, and reports prepared. All information will become part of the Rapid Response System operating record and will be kept for a minimum of 5 years at the Environmental Management Division at Deseret Chemical Depot. The contracted Utah-certified laboratory used for non-agent analysis (RCRA waste characterization) will also maintain sample analytical results and records.

4-3 WASTE ANALYSIS REQUIREMENTS PERTAINING TO LAND DISPOSAL RESTRICTIONS [40 CFR 264.13(c) and 268.7; R315-8-2.4 and R315-13-1]

The Hazardous and Solid Waste Amendments prohibit the land disposal of certain types of wastes that are subject to RCRA regulations; generators of wastes prohibited from land disposal under 40 CFR 268.35 must determine whether the applicable treatment standards specified in 40 CFR 268.40 and 268.48 have been met for their wastes and treatment residues prior to ultimate land disposal. All of the wastes that will be accepted for treatment in the Rapid Response System glovebox will be subject to LDRs. All Rapid Response System treatment residues will be managed in accordance with LDR requirements. Information presented in this section describes how the wastes that are subject to LDRs will be documented and certified.

Treatment conducted in the Rapid Response System glovebox will be performed to meet the Army-established treatment goals for chemical agent, as specified in Table 4-5. To allow safe handling and shipment of these wastes to a commercial hazardous waste TSDF for further treatment to meet the LDRs prior to ultimate disposal. Treatment in the Rapid Response System glovebox system will be accomplished by altering the chemical properties of the chemical agents by the oxidation reaction with appropriate treatment reagents or decontamination solution (5-percent sodium hypochlorite). All Rapid Response System waste streams will ultimately be sent offsite for further treatment at an approved hazardous waste TSDF.

The Deseret Chemical Depot Commander or a designated Deseret Chemical Depot representative will provide notification and/or certification with each shipment of waste to the receiving TSDF and will contain the information described in the following paragraphs.

If the neutralent and decontaminated dunnage waste streams are determined to be restricted wastes and do not meet the applicable treatment standards for the toxicity characteristic metals D004 through D011; toxicity characteristic organics D022, D028, D029, D034, D040, and D043; and P033 and P095 (as appropriate) per 40 CFR 268, Subpart D, a notification/certification will be sent with each shipment of the waste to the receiving TSDF, including the following information:

- o Generator name and address
- o EPA identification number
- o EPA and State hazardous waste number(s)
- o The hazardous waste constituents and applicable treatment standards, as well as:
  - Treatability group [wastewater (WW) or nonwastewater (NWW)] of the waste
  - Subcategory of the waste
- o Manifest number associated with the shipment of the waste.
- o Waste analysis data (where available)
- o Date subject to the LDRs.

Copies of all notifications, certifications, demonstrations, and other documentation produced to support the determination for restricted wastes treated onsite, or treated, stored, or disposed of offsite at an approved hazardous waste TSDF, will be retained in the operator files for a period of at least 5 years from the date that the waste that is the subject of documentation was treated or sent to an offsite hazardous waste TSDF.

Section 4-3a addresses the waste characterization procedures used to determine if any Rapid Response System treatment residue is subject to LDRs. Section 4-3b describes the sampling and analytical procedures required for characterization of LDR wastes, and Section 4-3c addresses the required frequency of this analysis. Additional requirements for the Rapid Response System glovebox are addressed in Section 4-3d.

4-3a Waste Characterization

The waste characterization requirements that will be followed for the wastes subject to LDRs are the same as described in Section 4-1 of this permit application. Additionally, the neutralent waste streams are expected to contain the following underlying hazardous constituents at levels above their Universal Treatment Standard (UTS): 1,1,1-trichloroethane; 1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane, and/or 1,1,2,2-tetrachloroethane. Generator knowledge, supporting bench scale analytical data, and RCRA characterization analyses (Utah-certified laboratory) will be used to determine the presence of these underlying hazardous constituents in the neutralent waste streams. Compliance with 40 CFR 268.7(a)(1) will preclude any improper notification or characterization with respect to the LDRs.

4-3b Sampling and Analytical Procedures

The sampling and analytical (test) methods that will be followed for wastes subject to LDRs are the same as described in Sections 4-2b and 4-2c of this permit.

4-3c Frequency of Analysis

The frequency of analysis requirements that will be followed for wastes subject to LDRs are the same as described in Section 4-2d of this permit.

4-3d Additional Requirements for Treatment Facilities

The following paragraphs describe the additional sampling, analytical, and documentation requirements for wastes treated in the Rapid Response System glovebox.

4-3d(1) Offsite Facilities

All wastes (chemical agent CAIS and chemical agent-contaminated dunnage) accepted for treatment in the Rapid Response System glovebox will originate onsite at Deseret Chemical Depot; therefore, the requirements of this section are not applicable.

4-3d(2) Analysis of Treatment Residues

The effectiveness of treatment will be determined by conducting chemical agent analysis on a representative sample of each neutralent and decontaminated dunnage waste drum to verify chemical agent concentrations are below 50 parts per million. This determination will also be based on documented process knowledge, treatment system performance, and supporting bench-scale demonstration analytical data on neutralent and decontaminated dunnage waste streams (performed at ERDEC). Section 4-1a(2) provides further details. Table 4-12 lists the Rapid Response System treatment residues that may be subject to the LDRs, the anticipated RCRA waste codes assigned, potential underlying hazardous constituents above the UTS, and the applicable UTSs.

Additional non-agent analyses (RCRA characterization) of treatment residues will be conducted on representative samples of each waste stream type generated to properly characterize the waste prior to shipment to a TSDF and to determine if the residual waste is still subject to LDRs. These analyses will be conducted by an approved, Utah-certified laboratory.

4-3d(3) Sampling and Analytical Parameters

The neutralent and decontaminated dunnage waste drums will be sampled for chemical agent analysis by the methods described in Section 4-2c. Chemical agent analytical samples will be taken while the drums are under engineering control (in the glovebox waste containerization system). Approximately 50 milliliters will be needed as a sample for chemical agent analysis. The samples will be placed into an appropriate sampling jar or vial. The samples will be sent to an approved agent laboratory where they will be analyzed for chemical agent using the Army-approved methods specified in Table 4-7.

All sampling and analysis performed will be in accordance with the WAP, as described in Section 4-2 of the permit.

4-3d(4) Frequency of Analysis

Treatment effectiveness for the neutralent and decontaminated dunnage waste streams will be determined by sampling and analyzing each drum generated for chemical agent concentration.

Table 4-12.
RRS Treatment Residues and the Applicable Land Disposal Restrictions
Universal Treatment Standards

Waste Stream	Anticipated RCRA Waste Codes	Non-Wastewater Concentration
RED, BLUE, CHARCOAL Process Neutralents; Decontaminated (Chemical Agent Only) Dunnage	D004	5.0 (mg/L TCLP)
	D005	7.6 (mg/L TCLP)
	D006	0.19 (mg/L TCLP)
	D007 (Total)	0.86 (mg/L TCLP)
	D008	0.37 (mg/L TCLP)
	D009	0.025 (mg/L TCLP)
	D010	0.16 (mg/L TCLP)
	D011	0.30 (mg/L TCLP)
	D019	6.0 (mg/kg)
	D022	6.0 (mg/kg)
	D028	6.0 (mg/kg)
	D034	30.0 (mg/kg)
	D039	6.0 (mg/kg)
	D040	6.0 (mg/kg)
	D043	6.0 (mg/kg)
	1,1,1-trichloroethane and/or 1,1,2-trichloroethane[a]	6.0 (mg/kg)
	1,1,1,2-tetrachloroethane and/or 1,1,2,2-tetrachloroethane[a]	6.0 (mg/kg)
Decontaminated (Chemical Agent/Industrial Chemical) Dunnage	D004	5.0 (mg/L TCLP)
	D005	7.6 (mg/L TCLP)
	D006	0.19 (mg/L TCLP)
	D007 (Total)	0.86 (mg/L TCLP)
	D008	0.37 (mg/L TCLP)
	D009	0.025 (mg/L TCLP)
	D010	0.16 (mg/L TCLP)
	D011	0.30 (mg/L TCLP)
	D019	6.0 (mg/kg)
	D022	6.0 (mg/kg)
	D028	6.0 (mg/kg)
	D034	30.0 (mg/kg)
	D039	6.0 (mg/kg)
	D040	6.0 (mg/kg)
	D043	6.0 (mg/kg)
	P033[b]	INCIN, CHOXD, WETOX
	P095[b]	INCIN

Notes:
[a] Underlying hazardous constituents that are expected to be present in the neutralent waste streams above the UTS.
[b] Waste codes P033 and/or P095 will only apply if the industrial chemical leaked is cyanogen chloride and/or phosgene, respectively. Technology-based standards apply for these waste codes.

CHOXD = Chemical oxidation as specified in 40 CFR 268.42
INCIN = Incineration as specified in 40 CFR 268.42
TCLP = Toxicity Characteristic Leaching Procedure
WETOX = Wet air oxidation as specified in 40 CFR 268.42
Source: 40 CFR 268.40 and 268.48, Universal Treatment Standards table.